Docket No.: 341148021US
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Wright et al.

Application No.: 10/750,165 | Confirmation No.: 5006

Filed: December 31, 2003 | Art Unit: 3768

For: RECEIVER USED IN MARKER LOCALIZATION SENSING SYSTEM AND TUNABLE TO MARKER FREQUENCY | Examiner: E. Weatherby

AMENDMENT FILED CONCURRENTLY WITH RCE UNDER 37 C.F.R. 1.116

MS RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

INTRODUCTORY COMMENTS

This paper is filed concurrently with a Request for Continued Examination and is a bona fide effort by the applicant to advance prosecution of the application. In response to the Final Office Action dated March 31, 2011, finally rejecting claims 1-5 and 35-36, please amend the above-identified U.S. patent application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 9 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method of locating a marker associated with a patient, said marker having a marker resonant frequency, the method comprising:

(a) implanting said marker in the patient;

(b) applying an excitation at a frequency selected from a set of frequencies to said marker using an excitation source;

(~~b~~c) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(~~c~~d) iteratively repeating steps (ba)-(c~~b~~) for all of the frequencies in said set of frequencies;

(~~d~~e) identifying said marker resonant frequency based upon the multiple sets of plurality of inputs;

(ef) adjusting said excitation source to provide further excitation at said marker resonant frequency;

(~~f~~g) receiving a resonance set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said marker resonant frequency; and

(~~g~~h) analyzing said resonance set of plurality of inputs to determine said location of said marker.

2. (Original) The method of Claim 1 further including initiating multiple excitations at said marker resonant frequency and averaging said resonance set of plurality of inputs over said multiple excitations.

3. (Previously Presented) The method of Claim 1 wherein said set of frequencies has frequencies that are spaced apart.

4. (Previously Presented) The method of Claim 3 wherein the frequencies are uniformly spaced apart.

5. (Previously Presented) The method of Claim 3 wherein said set of frequencies has frequencies that span a marker resonant frequency range.

6. (Withdrawn) A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) applying an excitation at one of a set of frequencies to said marker using an excitation source;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) iteratively repeating steps (a)-(b) for all of the frequencies in said set of frequencies; and

(d) identifying said marker resonant frequency based upon the multiple sets of plurality of inputs, wherein identifying said marker resonant frequency includes using a ring time control processor.

7. (Withdrawn) The method of Claim 6 further including initiating multiple excitations at said marker resonant frequency and averaging said resonance set of plurality of inputs over said multiple excitations.

8. (Withdrawn) The method of Claim 6 wherein said set of frequencies has frequencies that are spaced apart.

9. (Withdrawn) The method of Claim 8 wherein the frequencies are uniformly spaced apart.

10. (Withdrawn) The method of Claim 8 wherein said set of frequencies has frequencies that span a marker resonant frequency range.

11. (Withdrawn) An apparatus for determining a marker resonant frequency of a marker associated with a patient, the apparatus comprising:

(a) an excitation source for applying an excitation at one of a set of frequencies to said marker using an excitation source;

(b) a receiver for receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) means for iteratively repeating steps (a)-(b) for all of the frequencies in said set of frequencies; and

(d) means for identifying said marker resonant frequency based upon the multiple sets of plurality of inputs wherein the means for identifying includes a ring time control processor.

12. (Withdrawn) The apparatus of Claim 11 further including means for initiating multiple excitations at said marker resonant frequency and averaging said resonance set of plurality of inputs over said multiple excitations.

13. (Withdrawn) The apparatus of Claim 11 wherein said set of frequencies has frequencies that are spaced apart.

14. (Withdrawn) The apparatus of Claim 13 wherein the frequencies are uniformly spaced apart.

15. (Withdrawn) The apparatus of Claim 13 wherein said set of frequencies has frequencies that span a marker resonant frequency range.

16. (Withdrawn) A system for locating a marker associated with a patient comprising:

an excitation source emitting an exciting waveform during an excitation interval, said exciting waveform causing said marker to resonate;

a sensing array including a plurality of sensing coils, said sensing coils outputting a plurality of inputs; and

a receiver for analyzing said plurality of inputs to remove noise from said plurality of inputs, said receiver acting on said plurality of inputs provided during a observation interval, wherein said receiver includes a ring time control processor that allows the adjustment of the interval of said observation interval.

17. (Withdrawn) The system of Claim 16 wherein said adjustment of said interval of said observation interval is automatically performed by said receiver.

18. (Withdrawn) The system of Claim 16 wherein said excitation source repeats said exciting waveform repetitively and said receiver averages said plurality of inputs over a plurality of said observation intervals prior to analysis.

19. (Withdrawn) A system for locating a marker associated with a subject comprising:

an excitation source for emitting an exciting waveform during an excitation interval, said exciting waveform causing said marker to resonate;

a sensing array including a plurality of sensing coils, said sensing coils collectively outputting a plurality of inputs during a observation interval; and

a receiver that window filters said plurality of inputs.

20. (Withdrawn) The system of Claim 19 wherein said window filter is a Blackman window.

21. (Withdrawn) The system of Claim 20 wherein said receiver is a coherent receiver.

22. (Withdrawn) The system of Claim 21 wherein said receiver identifies and corrects a phase shift from said plurality of inputs.

23. (Withdrawn) A method for locating a marker associated with a subject comprising:

providing an excitation source to emit an exciting waveform during an excitation interval, said exciting waveform causing said marker to resonate;

providing a sensing array including a plurality of sensing coils, said sensing coils collectively outputting a plurality of inputs during a observation interval; and

providing a receiver that window filters said plurality of inputs.

24. (Withdrawn) The method of Claim 23 wherein said window filter is a Blackman window.

25. (Withdrawn) The method of Claim 23 wherein said receiver is a coherent receiver.

26. (Withdrawn) The method of Claim 23 wherein said window filter is a matched filter.

27. (Withdrawn) The method of Claim 25 wherein said receiver identifies and corrects a phase shift from said plurality of inputs.

28-31. (Cancelled)

32. (Withdrawn) A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) applying an excitation at one of a set of frequencies to said marker using an excitation source;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) repeating steps (a)-(b) for all of the frequencies in said set of frequencies;

(d) interpolating a frequency response based upon the information obtained from steps (a)-(c); and

(e) identifying said marker resonant frequency based upon the interpolation.

33. (Withdrawn) The method of Claim 32 wherein said set of frequencies has frequencies that are spaced apart by a predetermined percentage.

34. (Withdrawn) The method of Claim 33 wherein said set of frequencies has frequencies that span a marker resonant frequency range.

35. (Currently Amended) A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) affixedly associating said marker with a patient;

(b) applying an excitation at a frequency selected from ~~one of~~ a ~~first~~ set of frequencies to said marker using an excitation source;

(~~b~~c) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(~~c~~d) repeating steps (a~~b~~)-(~~b~~c) for all of the frequencies in said first set of frequencies;

(~~d~~e) identifying a frequency band that contains said marker resonant frequency;

(e~~f~~) formulating a second set of frequencies within said frequency band and repeating steps (b~~a~~)-(c~~b~~) for all of the frequencies in said second set of frequencies; and

(~~f~~g) identifying said marker resonant frequency based on the response from step (f~~e~~).

36. (Previously Presented) The method of Claim 35 wherein said first set of frequencies has frequencies that span a marker resonant frequency range.

37. (Withdrawn) A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) applying a broadband excitation to said marker using an excitation source, said broadband excitation having frequency components within a marker resonant frequency range;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said broadband excitation; and

(c) identifying said marker resonant frequency based on said set of plurality of inputs.

38. (Withdrawn) The method of Claim 37 wherein said broadband excitation is applied multiple times and multiple sets of plurality of inputs are gathered and averaged.

REMARKS

Claims 1-27 and 32-38 were pending when the present Office Action was mailed on March 31, 2011, of which claims 6-27, 32-34, 37, and 38 have been withdrawn from consideration. In this response, claims 1 and 35 have been amended to clarify certain features of these claims and to expedite prosecution of this application; the foregoing amendment are made without prejudice to pursuing these claims in unamended or other forms in a continuation or other application. No claims have been canceled in this response and no claims have been added in this response. Accordingly, claims 1-5 and 35-36 are currently pending.

In the Office Action dated March 31, 2011, claims 1-5, 35, and 36 were rejected. More specifically, the status of the application in light of this Office Action is as follows:

(A) Claim 35 was objected to because of informalities; and

(B) Claims 1-5 and 35-36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Paradiso et al. (US Patent No. 6,404,340) in view of Rodgers et al (US Patent No. 6,340,932).

As a preliminary matter, the undersigned representative respectfully requests an Examiner's telephone interview prior to further substantive examination or issuance of a second Office Action in order to further prosecution of the pending application.

A. Response to the Objection to Claim 35

Claim 35 has been amended to address the Examiner's objection. Accordingly, applicants respectfully submit that the objection should be withdrawn.

B. Response to the Section 103(a) Rejection of Claims 1-5 and 35-36

The Examiner and the applicant have previously discussed the deficiencies of the Paradiso reference, which is the primary reference for all outstanding rejections.

The applicant maintains that Paradiso teaches a frequency sweeping device which is not adjustable. For example, Paradiso teaches an oscillator sweeping from 40 kHz to 400 kHz at a repetition rate of 30 Hz and fails to teach or disclose adjusting the excitation source to provide further excitation at the marker resonant frequency as disclosed and claimed in the pending application. (Paradiso, col. 4, lns 51-55)

More specifically, claims 1-5 and 35-36 stand rejected under 35 U.S.C. § 103(a) as being obvious over Paradiso in view of Rodgers. Applicants respectfully submit that each of the pending claims includes specific features that are neither disclosed nor suggested by the Paradiso or the Rodgers reference. For example, independent claims 1 and 35 recite a method of locating a marker that includes, *inter alia,* identifying a marker resonant frequency based upon multiple sets of plurality of inputs, adjusting an excitation source to provide further excitation at the marker resonant frequency and receiving a resonance set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said marker resonant frequency. As disclosed in the specification, manufacturing variances interfere with providing markers having an accurately predictable resonant frequency (Specification, page 15). As claimed, the tunable receiver identifies the resonant frequency of the marker and provides that information to the excitation source. The excitation source can then provide an exciting pulse at a frequency that is closely matched to the resonant frequency of the marker. In this manner, better performance can be obtained by the system. Several methods for identifying a marker resonant frequency are disclosed in the specification, including for example, an iterative manner, by choosing a ΔF frequency spacing as a fixed percentage of bandwidth, interpolating a resultant response, and by using a sparse set of excitation frequencies to search a frequency range. (Specification, page 15-17)

Furthermore, the receiver is adaptable to work in coordination with the excitation source to tune the system to the specific characteristics of the marker. (Specification, page 15) Specifically, the excitation source has an adjustable frequency that can be

tuned in accordance with analysis made by the receiver. (Specification, page 15) Thus, the determination of the resonant frequency of the marker may be done in an iterative manner to further include adjusting said excitation source to provide further excitation at said marker resonant frequency. (Specification, page 15)

Paradiso discloses a device and method capable of magnetic coupling which is tracked using one or more pairs of coils oriented such that, when the coils are energized, a substantially uniform magnetic field is created in a region between the coils. (Col. 1, lns. 55-58) The field magnetically couples into any appropriately aligned structures located in the region between the coils. (Col. 1, lns. 58-60) As such, Paradiso discloses a continuous wave excitation of constant amplitude and frequency.

Rodgers is directed to a carrier with an antenna for radio frequency identification. The Office Action has failed to articulate a rational apparent reason to redesign Paradiso with Rodgers to arrive at the features of the claimed invention. Instead, the Office Action includes the conclusory statement that: "because both Paradiso and Rodgers teach the detection and tracking of multiple circuits simultaneously, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the tuning marker Paradiso in view of the robust RF device resonant frequency identification scheme of Rodgers." (Office Action, page 5) Applicants respectfully disagree with this conclusory statement for combining these references to render the claimed invention obvious and more specifically disagrees with the Office Action's characterization of the teachings of Paradiso and Rodgers.

As described previously, Paradiso teaches a frequency sweeping device which is not adjustable. For example, Paradiso teaches an oscillator sweeping from 40 kHz to 400 kHz at a repetition rate of 30 Hz and fails to teach or disclose adjusting the excitation source to provide further excitation at the marker resonant frequency as disclosed and claimed in the pending application. (Paradiso, col. 4, lns 51-55) Furthermore, although the Office Action asserts Paradiso applies "an excitation at one of a set of frequencies to the marker...," applicants respectfully maintain that this is a

misstatement of what is disclosed in Paradiso. Paradisco discloses only a swept-frequency excitation scheme and never an excitation at a single frequency (Figure 3B; col 3, 51-54; col 5, 25-30). Furthermore, Paradiso discloses coils which serve as both excitation and sense coils (applicants note that Paradiso does not disclose the invention in these terms, these terms represent an application of applicants' terminology), but does not disclose separate excitation and sensing subsystems.

Furthermore, the approach disclosed and taught relies on this common feature and would cease to function if the excitation and sensing were split, therefore, the principle of operation of Paradiso would inappropriately be modified. According to the MPEP, "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious." (MPEP 2143.01(VI), The Proposed Modification Cannot Change the Principle of Operation of a Reference, *citing In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).)

In contrast to Paradiso, the pending application teaches and claims a method for determining a marker resonant frequency which includes a receiver tunable to a resonator frequency. (Specification, [0076]) More specifically, with regard to box 709 of Figure 7 of the pending application, the receiver 208 is adaptable to work in coordination with the excitation source to tune the system 100 to the specific characteristics of the marker. (Specification, [0077]) In particular, the excitation source 202 has an adjustable frequency that can be tuned in accordance with analysis made by the receiver 208. (Specification, [0077]) Applicants maintain that Paradiso fails to teach or disclose this and other features of the claimed invention. Furthermore, although the Examiner agrees that Paradiso does not expressly teach adjusting the excitation source to provide further excitation at a marker resonant frequency, the Examiner maintains that it would have been obvious to modify the tuning marker of Paradiso in view of the robust RF device resonant frequency identification scheme of Rodgers. Applicants disagree. Rodgers disclosed two circuits that may cooperate such

that energy received in a first pattern is re-radiated in a second pattern for further enhanced transceiver communication. Applicants fail to understand how Paradiso would be modified in a manner that would allow Paradiso to continue to include a receiver tunable to a resonator frequency with the teachings of Rodgers to yield an *excitation source* with an adjustable frequency that can be tuned in accordance with analysis made by the receiver. Applicants maintain that none of the cited prior art references corrects this deficiency and therefore, applicants respectfully request withdrawal of the 102 and 103 rejections. However, in view of the Examiner's recognition of the applicants' contribution over RFID tags, amendments clarifying the marker of the claimed invention includes implanting or otherwise affixedly associating the marker with the patient. (See Paragraph 15, Office Action). Applicants respectfully believe that these amendments place the claims in allowable condition over the cited art and therefore respectfully request Allowance. Applicants have submitted the forgoing amendments solely in an effort to expedite prosecution of this application and without prejudice to pursuing these claims in unamended or other forms in a continuation or other application.

Claims 1, 32 and 35 have been amended to correct informalities and clarify aspects of the claims in order to expedite prosecution and to place the application in better condition for allowance. Accordingly, applicants respectfully request entry of the amendment and acceptance of the Request for Continued Examination.

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicants are not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicants reserve the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly,

reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicants have made any disclaimers or disavowals of any subject matter supported by the present application.

In view of the above amendment, applicant believes the pending application is in condition for allowance. Applicants believe no additional fees are due with this response. However, if additional fees are due, please charge our Deposit Account No. 50-0665, under Order No. 341148021US from which the undersigned is authorized to draw.

If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to contact Susan Betcher at (206) 359-6088.

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Respectfully submitted,

By_____
Susan D. Betcher
Registration No.: 43,498
PERKINS COIE LLP
P.O. Box 1247
Seattle, Washington 98111-1247
(206) 359-8000
(206) 359-7198 (Fax)
Attorney for Applicant